

Report of the 16th IAEE European Conference, Ljubljana, Slovenia

The 16th IAEE European Conference was organized by the School of Economics and Business, University of Ljubljana (SEB LU), and the Slovenian affiliate of the IAEE – SAEE. The central topic of the conference was Energy Challenges for the Next Decade. The conference took place on 25-28 August 2019 at the premises of SEB LU, and was followed by a Post-Conference seminar on 29 August 2019. The SEB LU was proud to host 301 conference participants from 41 countries. The conference started with the PhD day and continued with presentations and discussions in eight plenary sessions and 49 concurrent sessions.

Remarks by Professor Nevenka Hrovatin

At the Conference Opening professor Nevenka Hrovatin, General Conference Chair, Vice-President of SAEE, welcomed all participants and distinguished guests. She expressed her sincere thanks to the general conference sponsor, the Energy Industry Chamber of Slovenia, associating several Slovenian energy companies, three golden sponsors (Petrol, Gen-I and ELES), patrons and all other sponsors, who made the event possible. She highlighted the commitment of the conference organizer SEB LU to the energy efficiency and sustainability, reflected in the comprehensive energy efficiency retrofit project at the School, the solar power plant on the SEB LU roof and in the activities to promote the energy efficient behaviour of the SEB LU employees. Professor Hrovatin was also honoured and proud that the IAEE entrusted this event to the co-organizer, the Slovenian national affiliate SAEE, a young affiliate established in 2015, and to the one of the smallest countries in the EU, Slovenia, with only 2,000,000 inhabitants, but with the robust energy system witnessed in its position in the WEC Energy Trilemma Index.

For her personally, this event also marked her long-standing commitment to the IAEE starting in 1996 with her first participation in the IAEE conference in Budapest. Professor Hrovatin invited all participants to enjoy the conference program with distinguished speakers and chairs in the energy field and all social events. Amongst these was the opportunity to experience driving in Tesla electric cars, provided by the golden sponsor GEN-I.

In her speech at the Gala dinner in Cankar Hall professor Hrovatin thanked the International Program Committee, reviewers and the conference team (Jelena Zorić – Chair of the Organizing Committee, Sarah



Jezernik – Chair of the Sponsorship Committee, Matej Švigelj – Chair of the Local Organizing Committee, two young researchers and doctorate students for the PhD day and other conference support (Janez Dolšak and Ivana Jovović, Jana Pucelj – general conference secretary and other team members) for dedicating their time and skills in the last two years to the successful organization of the conference. She also addressed special thanks to the participants' serious work and positive energy seen during the conference: the latest being just the right one in the energy mix – renewable energy.

Conference Opening and Welcome Address

The official conference opening took place on Monday, 26 August. Conference participants were greeted by Professor Nevenka Hrovatin, General Conference Chair, Professor Metka Tekavčič, Dean of SEB LU, Christophe Bonnery, President of IAEE and FAEE and Marjan Eberlinc, President of the Energy Industry Chamber of Slovenia and CEO of Plinovodi d.o.o. A special recognition of the Republic of Slovenia to the conference was acknowledged by the welcoming speech by Alenka Bratušek, Minister of Infrastructure of the Republic of Slovenia:



Dear fellow guest speakers, distinguished participants, ladies and gentlemen,

I am pleased to welcome you here in Ljubljana at the sixteenth European Conference of the International Association for Energy Economics. On behalf of the Government of Slovenia I'd like to thank the Faculty of Economics, the Association and all others who made this event possible. It is now more than 40 years that the Association and its partners have been organizing such conferences – and this platform that you have established throughout the years is now more important than ever.

We live in exceptional, yet challenging times. On one hand, we are witnessing the complete digitalisation of our lives and constant technological innovation. On the other, we have the threat of climate change. The energy sector is somewhere in between. Because of this, we, the professionals working in the field of energy, have a crucial role. We have to be on track with innovations in energy and other sectors. And we should also envision the use of these innovations in the transition to carbon-neutrality. In order to achieve this, conferences such as this one are a must.

We have to exchange our knowledge, discuss our research and opinions, and base our decisions on

well-funded arguments. The task we have to deal with is complex, and we'll all have to share our best practices to avoid unnecessary mistakes. As you surely know, Slovenia is sixth in the World Energy Council's Energy Trilemma Index, and it is our plan to keep our energy system one of the best in the World. In our legislative actions, we consider and build on the five megatrends in energetics, that is decarbonisation, democratisation, digitalisation, decentralisation and deregulation.

We believe that in the near future, the energy consumers-turned-producers will have an active role in energy supply and security. We are aware of the possibilities that smart-grids will bring in the distribution of electrical power. And we also focus our efforts in developing a sound e-mobility and public transportation policy and make the buildings and industry in Slovenia more energy efficient so to achieve our goals in regards to energy environmental sustainability.

Some of these measures come free of charge, but in most part, the transition to carbon neutrality will demand high expenses. I believe this question, the question of financing the decarbonisation process, is one that will occupy you the most during your debates here in Ljubljana and when you are back home. And it is one that is constantly on the mind of everyone involved in this great project of the human race.

Here, I'd like to point out that for me and my colleagues at the Ministry, energy is not only a commodity, but also a common good. With affordable energy we have a better functioning and more inclusive society, and solid ground for a competitive economy. Therefore, in our common transition to carbon-neutral energy sources, we should not only seek to maintain our energy systems robust. We must also focus on making energy stay at least as affordable as it is today.

Dear ladies and gentlemen, we are at a historical turning point for our species and our planet. Talking about likable visions of the future is easy, yet the questions that we have to find answers to are very, very hard. Nevertheless, I believe in our success. I believe we can propose realistic measures to achieve our goal and to finally make a strong step towards a zero-emissions society.

I wish you a nice stay in Ljubljana and a great learning experience here at the conference.

Hvala in lep pozdrav.«

Conference Social Programme

The official conference programme was accompanied by a social programme, giving participants a chance to network and continue the lively debates about the topics discussed during the official conference programme.

The Welcome reception was held at the SEB LU on 25 August 2019, immediately after the PhD day and the Special Seminar. The participants exchanged

impressions about interesting lectures they attended and got to know each other.

The Cocktail dinner was held at the Ljubljana castle on 26 August 2019. The Ljubljana Castle, standing on a hill above the city for about 900 years, is the main attraction of Ljubljana. The castle's Outlook Tower and ramparts offer some of the most beautiful views of the city, while the castle houses a museum exhibition on Slovenian history, a puppet museum, and a number of historical rooms such as the Chapel of St George, the Prison, and a video presentation room called Virtual Castle.

The Gala dinner was held in the Grand Hall of Cankar Hall Centre (Hall) on 27 August 2019. The Cankar Hall is a multipurpose centre. Designed by Edo Ravnikar, the student of the notable master of architecture Jože Plečnik, Cankarjev dom is an architectural gem, whose splendour has not diminished with time.

Participants were entertained by the zither music (Blaž Kladnik) and the Award Ceremony (Best Student Paper Award: first place Marco Horvath; second place shared between: Maja Žarković and Filip Mandys; third place Steffen Lewerenz; Best Poster Award: Niklas Wulff and 2019 Journalism Award: Amena Bakr).

During the conference the participants also had the opportunity to experience driving with Tesla electric cars (sponsored by GEN-I) to the vicinity of Ljubljana (Gin Distillery, Bakery and the Lake Zbilje). For accompanying persons sightseeing of Ljubljana and tours to the Postojna Cave and Piran and to the Lake Bled were offered.

Conference Programme

PHD Day – Sunday 25 August

Students and young professionals were encouraged to take part in two PhD day seminars: Seminar 1 How to Write Papers for Publication in Scientific Journals given by Adonis Yatchew (Editor in Chief, Energy Journal; Professor at the University of Toronto) and David Broadstock (Deputy Director and Assistant Professor, Center of Economic Sustainability and Entrepreneurial Finance, Hong Kong Polytechnic University), and Seminar 2 How to Present Research Work in Scientific Conferences given by Markus Graebig (Project Director, WindNODE Consortium). The PhD day concluded with a Special Seminar opened to all conference participants Teaching Energy – Where Does One Begin? by Adonis Yatchew.

Opening Plenary Session Monday 26 August

Energy Landscape of 2030: Challenges and Opportunities

Summarised by Ivana Jovović, PhD student and young researcher at SEB LU

The opening plenary session of the 16th IAEE European Conference was chaired by Christophe Bonnery, President of the IAEE. The plenary speakers were Laurent Schmitt, Secretary General of ENTSO-E,

Edward C. Chow, Senior Associate in the Energy and National Security Program at the Center for Strategic and International Studies (CSIS), USA and Alberto Pototschnig, Director Ad Interim, European Agency for the Cooperation of Energy Regulators (ACER).

Laurent Schmitt in his presentation *Energy Transition - Three Ds: Decarbonisation, Decentralisation and Digitalization* remarked how we are at the centre of a significant transformation. In fact '4Ds' transforming the energy market (decarbonisation, decentralisation, digitalisation, deregulation) may very well become '5ds' as we also have democratisation when we put the end users in the equation. The last EU energy package, according to Laurent Schmitt, has set very ambitious targets for 2030 and 2050. However, there remains a fundamental question whether this is enough. It is up to grid operators to find the best pathways to the long-term targets, and to design scenarios how these targets could be realized. Laurent Schmitt reminds that we have now prosumers, energy communities, smart cities and micro grids appearing at the pan-European level. While the power system evolves, the governance must also change. It is fundamental to enable new transparency in our power system, and align data integration between TSOs and DSOs, especially so when it comes to the congestion management. In concluding remarks Laurent Schmitt emphasized ENTSO-E would continue to support engineering network codes, try to anticipate innovations and project and what is going to happen to the European power system.

Edward C. Chow in his lecture *European Energy State-of-the-Art: An Outside View* noted that when looking at the next ten years it is forecasted that the USA would increasingly be an exporter of oil. It is also forecasted that gas trading in the USA is going to look increasingly as oil trading in the last couple of decades. Europe is import dependent – more dependent on gas, and less import dependent on oil. It is forecasted that the net oil and gas import dependency in the EU will increase by 2035. Edward Chow concluded that in fact, it is not the USA's energy dominance; it is the USA's energy divergence from the rest of the global markets that we should consider in its relations not only to the peer competitors, but also to the closest allies and trading partners of the USA, including Europe.

Alberto Pototschnig began his presentation on the *Clean Energy Package and the Future Challenges for the Energy Sector* by noting that regulation should keep up the pace with the change in technology, and that regulatory framework must adapt without creating uncertainty. The Clean Energy Package is the last item in the sequence of packages that started in mid to late 90s which would enable the EU to deliver on Paris Agreement commitments. Decarbonisation, while being an obvious way of saving the planet, is a challenge when it comes to the energy system. Alberto Pototschnig concluded that with the increased sector coupling, gas resources could provide flexibility to the electricity system.

Dual Plenary Session 1 Prospects for Future Electricity Markets

Summarized by Elijah Sriroshan Sritharan, PhD student

Dual Plenary Session 1 was chaired by Hans Auer, Associate Professor at the Vienna University of Technology. The plenary speakers were Richard Green, Professor of Sustainable Energy Business at the Imperial College Business School, Reinhard Haas, Professor at the Vienna University of Technology, and Markus Graebig, Project Director of the WindNODE Consortium.

Richard Green began his presentation *A Tale of Two Markets: Contracts for Renewable and Conventional Generators* with explaining how in recent years learning curves for wind and solar PVs have come down drastically and as a result the cost of electricity generated from these technologies have plunged sharply. Lower generating costs of wind and solar PVs have created a huge problem for electricity utilities, which either buy or produce electricity from coal-powered or gas-powered (conventional) generators in the electricity market. Richard Green continued by making a remark that tumbling prices for solar and wind energy technologies and rapidly increasing expansion in these sectors do not mean that the renewable energy industry will be able to out-manoeuvre the fossil fuel industry overnight. The challenge the renewable energy sector faces is the energy storage. Richard Green's concluding remarks were that energy storage reduces generation costs during periods of peak demand and enables the grid controllers to manage unexpected variations in the demand or sudden losses in the electricity production capacity until alternative generating sources can be brought into action.

Reinhard Haas gave the lecture titled *Heading Towards Sustainable and Democratic Electricity Markets*. He noted that solar and wind have shown very rapid growth in recent times and the outlook for them is promising. The cost of the new-built wind and solar power generators have fallen below the cost of running the conventional ones. However, it is not possible to force "variable renewables" into the system. Nevertheless, there is a strong desire of some customers to participate in the electricity supply. For the supply to become predominantly renewable, the grids need to become more flexible and adaptable than they are today. Reinhard Haas concluded that the abundance of digital communication (smart grid) between the electricity consumer and electricity provider has opened up the possibility of a two-way communication. Integrating large amounts of wind and solar PVs requires new ways of operating the grids that will involve smart grids and more back-up supplies.

Markus Graebig's presentation gave an insight into the *Sector Coupling, Flexibility and Outlook on the 2nd Phase of Energy Transition – Experiences from the WindNODE Project*. WindNODE project includes

over 70 partners working in 50 subprojects to provide a detailed view in various aspects of the intelligent energy system of the future. All partners are working together within four focus areas to enable a broad view of the intelligent energy system of the future: identifying flexibility, activating flexibility, digitalising the energy system, and developing a reality lab. As Markus Graebig explains, the first focus area refers to where and how potentials for technical load shifting as well as sector coupling can be found in north-eastern Germany. Digitalising the energy system means integrating large quantities of renewable energy into the energy system in a smart and efficient way. Finally, WindNODE is successfully making use of the new "reality lab" R&D format in north-eastern Germany for the first time. This serves to test out new operating and business models without incurring economic losses.

Dual Plenary Session 2

Prospects for Future Natural Gas and Oil Markets

Summarized by Janez Dolšak, PhD student and young researcher at SEB LU

Dual Plenary Session 2 was chaired by Kostas Andriopoulos, Executive Director of the Research Centre for Energy Management and Professor at the ESCP Europe Business School, Chairman of HAEE. The plenary speakers were Karolina Čegir, Gas Expert at the Energy Community Secretariat, Lucie Roux, ESCP Europe Business School Alumna, and Tatiana Mitrova, Director at the Energy Center of the SKOLKOVO Business School.

Karolina Čegir in her presentation Gas Markets and Infrastructure: Focus on Europe noted that Europe in general has good gas infrastructure to have a developed gas market. There is a clear interaction between the infrastructure and markets as the gas sourcing cost decreased generally in Europe by the development of gas infrastructure. It is expected that the demand for gas in Europe in the next two decades will be stable. A lower production will be replaced by imports, especially by LNG. Gas is also the only fossil fuel whose share in the total energy demand will grow until 2035. The natural gas in the EU has been declining the least of all fossil fuels keeping more or less its current share of 25% through 2030 and losing just one percentage point up to 2050. Hydrogen and methane have the brightest future among gases. When focusing on the Central-Eastern and the South-Eastern Europe we can observe lower levels of development of gas infrastructure in comparison to the rest of Europe. Local and regional markets influence the development more than long term contracts. Only few sources of supply are available. Plans to develop national networks exist, however their implementation is often delayed. This region faces a necessity for a new gas infrastructure.

Lucie Roux began her presentation Europe Cementing a Key Role in LNG: Global Balancer, Price

Anchor and Demand Centre in its Own Right by explaining the Europe's aim is to become the global balancer, the price anchor and the demand centre for LNG. LNG trade flows have gradually shifted from a demand pull into Asia to a supply push into Europe since the fourth quarter of 2018. Surging the supply and weaker Asian prices accentuated this shift in 2019. This is because reloads from Europe to Asia have narrowed. In addition, Russian and USA LNG flows to Europe have increased strongly since the fourth quarter of 2018. Russia is steadily rising in the ranks of European LNG suppliers: a trend likely to persist with the coming new capacity. Regasification capacity utilization is up to 70% in North-Western Europe. Europe is the key LNG balancing market, the price anchor and the demand hub. Liquidity has surged, especially at the Title Transfer Facility (helped by LNG imports growth). The influence of Dutch gas hub in LNG pricing is growing. A weak demand in Asia could be short-term: Japan Korea Marker/ Title Transfer Facility spread could widen. However, Groningen production in Europe is set for a rapid decline, so more gas/LNG imports will be needed. The decline of the European domestic production and the coal phase out from the energy mix will support LNG imports. New import LNG terminal projects in Europe are in preparation. The EU has provided the initial support for four other LNG projects (Ireland, Greece, Sweden, and Poland). Lucie Roux concluded that LNG is as a fuel mostly present in medium and small scales. There is a growing consensus that LNG is the best solution as no equivalent alternatives that can match LNG's emissions profile and scalability are available (IMO 2020). The European small scale LNG market is expected to grow, which is also supported by the International Maritime Organization 2020.

Tatiana Mitrova shared her expertise in the Geopolitics of the European Gas. She stated that today's major four European gas suppliers are Russia, Norway, Algeria and Qatar, while for LNG, the major four suppliers are Qatar, Australia, Russia and the USA. According to the current trend, until 2030 this list will slightly change as the USA will continue increasing its imports and will become the second most important supplier for Europe. Russia, Norway, Algeria, Qatar and the USA are key gas suppliers of all gases for Europe. However, these markets are not equally stable suppliers for Europe. Qatar, for example, is known to be more profit seeking market and adjust their export between Europe and Asia according to the prices at each market. The global energy landscape and energy flows are changing and niches in the buyers' market are shrinking. There is a huge energy interdependency between the EU and Russia. Political issues between parties are associated with the geopolitics. Transactions costs in pipeline gas trade define institutional structures of the gas markets. The European gas market consists of two segments: the LTCS and the SPOT market, where the Russian company GAZPROM secured impressive portfolio of the former. Russia has

also the largest contract portfolio, which guarantees at least 120 billion cubic meters per annum. The Russian gas pipelines are well placed in Europe to allow Russian gas to compete on the SPOT market with the LNG. It is expected that global oil prices and the Asian gas demand will define the European gas market situation.

Joint concluding remarks from this dual plenary session were that in the power sector we can expect a weak electricity demand growth, a fast expansion of RES, and still a strong coal presence (due to the low price of coal). Further, global oil prices and the Asian gas demand will define the European gas market situation.

Dual Plenary Session 3, Tuesday 27 August Energy In The Digital World: The Shifting Fundamentals Of The Energy Business.

Summarised by Ivana Jovović, PhD student and young researcher at SEB LU

Dual Plenary Session 3 was chaired by Christian von Hirschhausen, Professor of Economic and Infrastructure Policy at the Berlin University of Technology, and Research Director at DIW Berlin. The plenary speakers were Gašper Artač, Head of the Energy Management Centre at Petrol d.d., Christoph Burger, Senior Lecturer at the ESMT Berlin and Hans Auer, Associate Professor at the Vienna University of Technology.

Gašper Artač talked about Making the Energy Transition Happen – Smart Technologies and New Business Models. As Gašper Artač highlighted, Petrol's vision for 2022 is a commitment to integrate energy, trade, mobility and advanced services into an excellent user experience offered by the important regional provider of comprehensive and sustainable solutions. He presented major energy industry trends and strategies, including RES generation, the efficient energy storage, electric vehicles, micro grids and the establishment of energy communities, and gave insights into major trends from the industry point of view. As Gašper Artač emphasized, Petrol implements projects related to e-mobility, RES generation, and integrated energy solutions (Compile and X-FLEX) in order to respond to the changes in energy technologies and consumers' demands.

Christoph Burger covered in his presentation Digitalization in the Energy World: the Role of Big Data, Artificial Intelligence, Blockchain and Cyber Security. He noted that digitalization investments aim to enable better performance, new networks and services in the light of a new energy world. Further, the artificial intelligence is creating opportunities for new service models with providers still controlling it by humans. Blockchain is seen as a game changer or, with further dissemination, likely providing the process and platform solutions with no hurdles for implementation. Christoph Burger concluded that the cyber security is getting more important while the smart meter

infrastructure is specifically vulnerable at the edge.

Hans Auer talked about Competitiveness of Different Renewable Energy Community Concepts in a Smart Energy Future. He highlighted that robust business models on the local energy community level will emerge if 'old fashioned' policy making, legislation and regulations do not prevent cooperation and innovation. Energy community concepts will benefit from digitalization and will increasingly become self-sufficient. Further, he noted that grid tariff design is expected to head increasingly towards fixed charges in a RES world. In the end, Hans Auer emphasised that the resource adequacy questions safeguarding robust and smooth electricity market operation will become even more essential than today.

Dual Plenary Session 4 Challenges in the Final Energy Use: Innovation, Technology, Efficiency, Conservation

Summarized by Matej Švigelj, Associate Professor at SEB LU

Dual plenary session 4 was chaired by Reinhard Haas, Professor and Head of the Energy Economics Group, Institute of Energy Systems and Electric Drives, Vienna University of Technology. The plenary speakers were Amela Ajanović, Associate Professor at the Vienna University of Technology, Georg Erdmann, retired Professor from the Berlin University of Technology and Michaela Valentová, Researcher at the Czech Technical University in Prague.

Amela Ajanović presented *Electrification in Transport: Economics and Environmental Aspects*. Since transport accounts for more than 20% of GHG emissions in the EU, effective policies and measures are needed. She stressed that full environmental benefits of electric vehicles (EV) will be achieved only if EVs are powered by electricity generated from RES. Finally, she noted that everything cannot be solved using EVs, but a new mobility behaviour is needed as well.

Georg Erdmann discussed the issues related to *Markets for New Energy Storage Technologies*. He emphasized that it is rather challenging to develop promising business cases for electric storage systems due to high investment costs and cannibalization effects. Further, capacity markets are not a sustainable solution, while financing storage systems through monopolistic companies (grid operators) could be a feasible solution.

Michaela Valentová gave an overview of the Energy Efficiency Policy in (Central) Europe - Targets, Instruments, And Investment. She noted that there is a gap between the investment needs and the current scale of investments. Therefore one of the main challenges is to foster the investments. Further, systematic monitoring and evaluation of outcomes should be implemented. In addition, she also suggested the implementation of a broader set of financial (and other) instruments.

Dual Plenary Session 5
Energy and Climate: International Governance of Energy Transition

Summarized by Elijah Sriroshan Sritharan, PhD student

Dual Plenary Session 5 was chaired by Andreas Löschel, Professor and Chair for Energy and Resource Economics at the University of Münster. The plenary speakers were Frank Jotzo, Professor and Director of the Centre for Climate Economics and Policy at the Australian National University's Crawford School of Public Policy, Georg Zachmann, Senior Fellow at Bruegel and Maria Sicilia, Chief Strategy Officer and a member of the Executive Management Board at ENAGAS, the owner and transmission system operator of the Spanish gas network and a leading global gas infrastructure company.

Frank Jotzo delivered a presentation on the topic What does the Paris Agreement imply for the Governance of Long-Term Low Emissions Development Strategies? He started with a question what was needed for decarbonisation with regard to the governance of national level low-emissions development strategies. Policymakers should understand "scenarios", for example, possible low-emissions strategies and conduct multi-scenarios on wide-range of areas, such as the future technology, economy, etc. First must understand "pathways", for example emissions, policy and governance pathways and finally they must understand "options and choices" in new energy industries and also beyond the energy sector. Second, policymakers should go beyond their ministries and cooperate with institutions such as the German Coal Commission and the UK's Committee on Climate Change. Frank Jotzo recalled that frameworks exist that can facilitate the transition. Public investments in policies with clear objectives are paramount, and so is regulation. He concluded that low-emissions development strategies should be regularly and critically assessed and monitored in terms of their direction, speed and the nature of transition.

Georg Zachmann began his presentation Current Discussions on Energy and Climate Targets by stating that the EU has emerged as one of the leading advocates for reducing emissions and has adopted ambitious carbon emission reduction targets. Member States in the EU report which policies they have and what impact these policies have on (1) non-Emission Trading Scheme emissions (2) renewable energy sources and (3) energy consumption. The RES ambition is overall in line with the 2030 targets, but individual member states under-perform. Member states also have national targets for the greenhouse gas emissions, share of renewables, energy efficiency, etc. Paris Agreement sets global targets, regarding the allowed temperature increase and the carbon neutrality.

Maria Sicilia began her presentation What is the

Investment Framework Needed to Perform the Energy Transition? by noting that a critical task for governments is to ensure timely investments in green technologies which should be implemented on the appropriate scale. Currently, the private return on green investments lies significantly below the social return. The private sector responds to market incentives and price signals, but also to the policy uncertainty. A robust and gradually rising long-term carbon price is essential. RES have to go beyond the power sector. The innovation is needed for a seasonal storage and carbon capture, storage and use.

Dual Plenary Session 6
Future Role of Consumers, Prosumers and Prosumagers

Summarised by Ivana Jovović, PhD student and young researcher at SEB LU

Dual Plenary Session 6 was chaired by Jelena Zorić, Associate Professor at the School of Economics and Business, University of Ljubljana (SEB LU) and Chair of the Organising Committee. The speakers were Massimo Filippini, Director of the Centre for Energy Policy and Economics (CEPE) at ETH Zürich, Reinhard Madlener, Professor at RWTH Aachen University and Director of the Institute for Future Energy Consumer Needs and Behaviour (FCN) and Dejan Paravan, Chief Innovation Officer for the GEN-I Group.

Massimo Filippini gave a presentation on the topic Understanding Consumer Behaviour: Energy Efficiency Gap, Bounded Rationality and the Role of Energy Related Financial Literature. He noted that consumers are boundedly rational when it comes to making energy efficient choices about their consumption. The level of energy financial literacy and financial literacy impact the decision making process of consumers. He further suggested that in order to improve the level of energy efficiency we could: 1) oblige the producers of electrical appliances to provide monetary information for the yearly energy consumption on the energy label, 2) promote educational training on energy and investment related topics, 3) provide decision support tools such as online or mobile phone calculator tools or calculators at the point of sale and 4) promote energy audits at homes. In the near future the set of digital and information technologies, home automation, new algorithms of artificial intelligence and "machine learning" will play an important role in helping consumers to make more sustainable development oriented choices.

Reinhard Madlener gave insights to Energy Prosumage, Energy Poverty, and Energy Justice. He observed that the scientific and political interest in the topics of prosumage, energy poverty and energy justice has strongly increased in recent years. The origin of the energy justice debate comes from the environmental justice literature and the relatively long history of the fuel poverty debate in the UK in times of rising energy prices. A consideration of energy poverty

and energy justice is also relevant for guiding any sustainable energy transition, not least for bearing the cost burden of the (existing, new and replaced) energy infrastructure and for maintaining the social cohesion. Reinhard Madlener concluded that the energy transition implies the shift towards new business models, different lifestyles, new policies, etc.

Dejan Paravan shared his experience of his company on *How Should Business Models Change in Consumer Driven Energy Markets?* He explained that the core business for the company GEN-I was traditionally trade and supply, but with the new developments of energy technologies and in response to the demands of consumers, a third area of core business comprises the development of energy services. In GEN-I digitalization has led to the new ways of customer interaction and communication and to the development of digital products and services accompanied by the emergence of new business models. Another trend is electrification, which should be addressed together with the energy storage, e-mobility, demand response and heating. In relation to decarbonisation targets, GEN-I responds with projects related to the self-consumption for the industry, energy communities, and individuals/households.

Closing Plenary Session Wednesday 28 August

Europe's Energy Sector in the Global Energy Industry: State-of-Affairs and the Future

Summarised by Ivana Jovović, PhD student and young researcher at SEB LU

Closing Plenary Session was chaired by Yukari Niwa Yamashita, IAEE President-Elect 2019, Board Member for the Institute of Energy Economics Japan (IEEJ) and Director in Charge of the Energy Data and Modelling Center, and the plenary speakers were Christian von Hirschhausen, Professor of Economic and Infrastructure Policy at the Berlin University of Technology, and Research Director at DIW Berlin, Michael Pollitt, Professor at the Cambridge Judge Business School and Joint Academic Director at the CERRE(Centre on Regulation in Europe), and Atanas Georgiev, Associate Professor and Vice Dean at the Sophia University St. Kliment Ohridski.

Christian von Hirschhausen presented *Energy Scenarios, Projections, and Modelling ("Academic approach")*: Case of the "Clean European Energy Package". Main findings of his presentation are that climate and energy scenarios are almost always a controversial topic. The discussion on these issues currently focuses on the "technology-supply-side", but we must also consider demand side mitigation. The fact that demand-side measures have not been systematically represented in scenarios has also been addressed by other researchers. Regarding the energy mix he commented that the nuclear power is not economically viable compared to other electricity sources and is more likely to be enforced

in less democratic (totalitarian societies). In his view the increasing energy efficiency is good, but it is not enough. We have to start thinking of considering behavioural changes and societal transformations. Quoting Beck and Mahony (2018), Christian von Hirschhausen finds that we need to engage in "messy business of socioeconomic scenario building". He emphasises the importance of transparency and open-data-open-code. In this respect, he concludes that there is still a lot of work ahead of us

Michael Pollitt in his speech gave the policy advices: *What Next for European Energy Policy? Suggestions for the New Commission*. His findings are that carbon and heat markets need to be aligned with electricity and gas markets. The reliance on significantly more renewables requires much higher levels of institutional and market alignments. In a low demand growth environment, the fixed network costs and how to pay for them require substantially higher attention. The energy and climate policy should also pay more attention to distributional issues. The biggest relative gains from the EU policy remain in the European periphery and this must be a key focus.

Atanas Georgiev gave a regional perspective on *South East European Energy Challenges and Opportunities Regional Energy Balances & a Case Study for Prosumers and RES*. Investments in large RES projects in this region practically stopped after 2012 (with the exception of some biomass plants). The development of small RES plants, close to consumption, has not taken off and without proper incentives could not be improved. One of the legal challenges is that the laws do not distinguish between small and large RES producers, thus giving advantage to multimillion investments in utility scale RES capacities. Therefore, key policy recommendations for the region would be ensuring the inclusion of all RES in transparent, non-discriminatory national electricity markets, development of special programs for the subsidised construction of small scale RES as well as reconsidering large scale, government sponsored energy projects in terms of their final consumers' costs compared to the costs of electricity generated in small RES plants.

Post Conference Seminar Thursday 29 August

Summarised by Ivana Jovović, PhD student and young researcher at SEB LU

The Post-Conference Seminar *Energy Transition and Power Markets* was delivered by Professor Richard Green, Imperial College Business School. The aim of the seminar was to give participants an overview of key economic and policy issues surrounding the transition to low-carbon electricity in market-based systems. Professor Green first covered the topic of *Fundamentals of Electricity*, concentrating on how economic costs can be minimized subject to the technical constraints imposed by the need to meet demand at all times without overloading the grid. He continued with the *Electricity Markets*, explaining

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SAEE SLOVENSKO ZDRUŽENJE za ENERGETSKO EKONOMIKO

Energy Challenges for the Next Decade

School of Economics and Business, University of Ljubljana, Slovenia

IAEE EUROPEAN CONFERENCE LJUBLJANA 2019: SCENES FROM THE CONFERENCE





optimal prices for power, how to pay for capacity, and different ways of pricing transmission constraints, discussing the difference between the USA and the European market designs, and how the operating constraints faced by power stations could affect electricity prices. Further, he focused on Renewables and Storage, examining how the intermittent nature of their output affects their value to the power system. Finally, he discussed Emissions Savings, setting out the economic theory underlying these issues with a “tutorial” approach, and presenting a number of recent research papers exploring these issues.



IAEE European Conference Ljubljana 2019 team